Advanced Amphibious Assault Vehicle Communications Concept In Support Of Operational Maneuver From The Sea

CSC 1996

SUBJECT AREA C4

Introduction

Operational Maneuver From The Sea (OMFTS) is a new way of thinking about an old subject--amphibious operations. Revolutionary tactics and technologies, currently emerging, enhance the potential for rapid power projection in the world's littorals, specifically in the area of ship to objective maneuver. To support this concept, the assault amphibian battalions within the Marine division will be equipped with the Advanced Assault Amphibian Vehicle (AAAV) which is currently in the conceptual stage of development, and may be notionally organized with 230 vehicles to lift the surface assault element of a Marine Expeditionary Force. The AAAV provides the following operational capabilities:

- **Provides mobility equal to the M1A1 tank ashore 45 mph hard surface road or 30 mph cross-country- -max range 300 miles at 25 mph.**
- **Provides a water speed of 20 knots at sea state 3--max range of 65 nautical miles.**
- **Defeats light armor at 1500 meters.**
- **Protects crew against 155mm fragmentation and the effects of NBC.**
- **Provides all-weather, day/night precision navigation and position location.**
- **Transports seventeen combat loaded Marines.**[1]

Weapon systems such as landing craft have increased, over the years**,** in range, precision, and lethality since World War II, current doctrine has not changed much. The Marine's amphibious assault capability is still applicable, even though it focuses on key terrain rather

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than on the enemy with the traditional ship-to-shore movement. For instance, ships deploy 4,000 yards off shore with surface assault craft that travel at speeds of six to eight knots per hour--a very slow, vulnerable force. Likewise, today's force structure and paucity of amphibious shipping will not allow for hundreds of ships in a small area disgorging wave after wave of linear attack formations onto heavily defended beaches.[2] The future AAAV's capability in mobility and speed challenges conventional wisdom in current and future employment. This capability concentrates forces, producing momentum and controlling tempo, and seizing the initiative, thereby forcing the enemy to react -- tenants to maneuver warfare. The key to successful development of the OMFTS concept lies in the Marine Corps' forward thinking approach to the command, control, communication, computer, intelligence and information (C4I2) architecture.

Will the AAAV be equipped with interoperable, redundant over-the-horizon communications to meet the future needs of OMFTS, or is it too early to tell what will be needed in the future? Additionally, can the Marine Corps continue to plan for mostly ground to ground communications systems given the potential distances of future ship-to-shore movement or emerging ship-to-objective maneuver?

Operational concept

The Operational Requirements Document (ORD) for the AAAV emphasizes the operational concept of power projection and forcible entry by way of mobility, flexibility, and technology to mass strength against weakness. Landing forces will capitalize on speed and

surprise, besides avoiding threats by choosing penetration points based on real time intelligence. Ultimately crossing the beach in a seamless maneuver, the AAAV can continue to the objective or redeploy into the sea to find a gap somewhere else along the littoral. To support this concept of maneuver, the ORD cites a need for a command and control mission role variant, designated the AAAVC that will provide the foundation for the future C4I2 architecture.

> **"The AAAVC will be employed as a mobile command post for commanders. It will provide the commander with the capability to communicate with senior, adjacent, and subordinate maneuver units; supporting arms units; and combat service support units. The AAAVC must be able to exchange data with the maneuver control, intelligence, fire support, and air support communications systems and position location reports through the command and control system of the time frame."**[3]

This C4I2 concept has not changed much from the past requirement of establishing and phasing command and control, fire support, and combat service support ashore at the tactical level. However, it's clear that future systems must support integration of other services for joint operations and ultimately fit in the "big picture" of global command and control architecture.

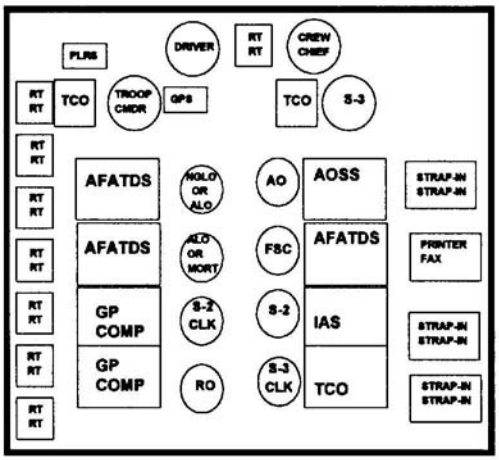
The primary responsibility to develop, in coordination with other services, the doctrine, tactics, and techniques for landing forces in amphibious warfare is the Marine Corps.[4] As the Marine Corps moves forward with emerging technology such as the AAAV and evolving doctrine to combat threats in the littorals, the focus of C4I2 should be on three items: **interoperability, redundancy,** and **over-the-horizon capability**. First, in joint operations, the AAAVC can expect to receive intelligence from all sources Unmanned Aerial Vehicles (UAV), Joint Maritime Command Information Systems (JMCIS), and perhaps Joint Tactical

Information Distribution Systems (JTIDS) in order to assist the commander in making timely decisions on penetration point objectives. In other words, during amphibious operations, instead of just one to two colored beaches, which allows for a battalion landing team to cross by surface means, to choose from, the landing force commander may opt "in stream" for as many landing beaches as his tactical reach will allow, based on timely intelligence and an ability to quickly disseminate orders to subordinates. Furthermore, interoperability means more than just a common encrypted voice net to the other services, it should be a shared picture of the battlespace so that commanders can anticipate enemy reactions and move by initiative vice orders. Second is redundancy in communication paths. The physical limitations of one or two command vehicles will not allow for a plethora of common doctrinal communications nets on one hull. In addition, the interference among radios and vulnerability of detection is significant.[5] Moreover, the types of planned antennas are omnidirectional which tend to further negate the advantage of surprise when transmitting. The requirement of seventeen doctrinal communication nets clearly overwhelm the resources and space available of one command vehicle (see figure 1).[6]

Lastly, most of the radios planned for are line of sight with a maximum range of 22 miles.[7] Assuming that most amphibious assaults with AAAV's will take place over-the-horizon at ranges of up to 25 nautical miles from land, the need for either more satellite single channel radios or satellite multichannel systems is increased. This facilitates the transfer of information and reduces radio interference and signature.[8] Today, most Marine Expeditionary Units (MEU) embarked aboard amphibious shipping travel with commercial cellular telephones or use the

ship's commercial International Maritime Satellite (INMARSAT) for dependable long haul communications. Since most tactical satellite communications are limited to one or two channels to support operations, this is not a bad idea. However, these commercial systems have disadvantages. For instance, cost to operate such a system is about 6 dollars a minute. Maintenance of the ground equipment and survivability of the satellite makes this choice of communications a critical vulnerability; however, I submit that the users of these systems never leave communications to chance. In the Year 2010 will the information highway extend to satellite constellations? In other words, will the globe be covered with satellite systems that service paying customers? The weight, space and power requirement of a cellular phone compared to a bench-mounted Single Channel Air Ground Radio System has to be worth exploring. At any rate, single channel radios of 1970's technology are in the current plan.[9]

CONCEPTUAL AAAVC COMMUNICATIONS SUITE



(FIGURE 1)

The Challenge

As stated by the Commandant of the Marine Corps in OMFTS,

"The equipment to make this transition from communications nets to information networks have already been developed. Making this new technology work however will require fundamental changes to the set of skills and attitudes possessed by those marines involved in command and control systems. The key to this capability thus lies in the realm of education and doctrine than it does in the realm of hardware."[10]

The most unique challenge for the Marine Corps is in planning and modeling for the future AAAV command and control concept. What do I mean by this? The rapid change in technology

easily outpaces current doctrine; for instance, the current command and control variant calls for nineteen to seventeen single channel radio nets to support a regimental command post. These nets found in FMFM 3-30 *Communications*, support command and control, fire support, intelligence, and combat service support. Furthermore, this baseline approach to outfitting or "best guessing" future needs of AAAV's does acknowledge a need for the communication support, but it does little to provide an integrated, netted, over-the-horizon capability for joint operations for a future command and control architecture. Imagine the complexity and vulnerability of controlling the battlefield with numerous emitters in close proximity with each other. Even if the AAAVC's were increased to two, three, or four per regimental command element, the coordination and execution of operations still requires an extraordinary communications effort to keep the system alive and well.

The bottom line is the current planned system for the AAAVC with its multitude of common doctrinal communications nets provides individual communication path with the limited range of Very High Frequency (VHF), line of sight Ultra High Frequency (UHF) and High Frequency (HF) radios which support local operations but do little for reliable Over-The-Horizon communications.

Present C4I2 System

The current AAV(C) 7 does not meet all the communications requirements of the supported units. The current doctrine in assault from the sea is that command and control requirements will have to satisfy longer ranges from units that are separated and have no organic reliable long

haul communications equipment. Current long haul systems include UHF tactical satellite and HF skywave communications. However, HF communications have questionable reliability because of the changing, and sometimes unpredictable, atmospheric conditions of the ionosphere.[11] These communication links bare the burden for most critical communications in excess of thirty miles.

Future OTH C4I2 Requirements

In the future, a battalion landing team during an amphibious assault may send multiple platoon size assault waves consisting of four AAAV's, at a minimum, from the line of departure at intervals up to ten miles, in order to maximize available littoral penetration points. This is a change from the current doctrine of stationing landing craft on line four to five thousand yards off shore, in ready circles, waiting for the command "Land the landing force." With twelve AAAV's the total separation distance of the end units could be up to thirty miles. Traditional VHF nets would not satisfy the requirements for last minute changes in the plan to exploit those fleeting opportunities. Control for such a large maneuver would be difficult. Single channel radio as a primary means for passing all required information would become jammed with regular voice traffic. In addition, the wave of AAAV's may have an emission control condition that would not allow for radio transmission, so each team would rely on a receive only broadcast from the flagship (normally) to ensure tactical surprise. However, this is emission control conditions varies with each operation and depends on the situation.

C4I2 Alternatives

In an effort to reduce the requirement for multiple radio nets, can the JMCIS capabilities

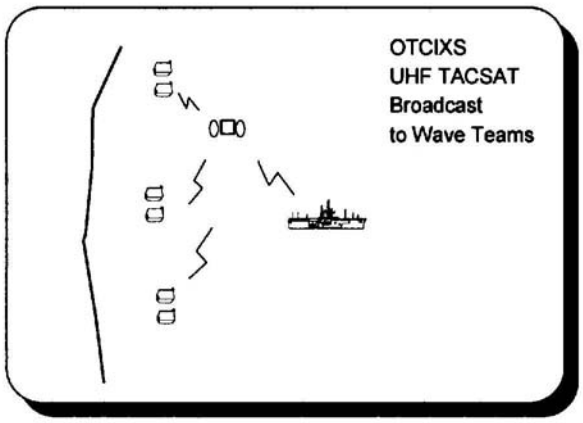
meet the needs of current doctrine that support command and control, fire support, and administration and logistics and still retain flexibility, reliability, and more importantly redundancy? As the Marine Corps migrates toward a common operating environment for command and control systems, it becomes clear that unity of effort in true global command and control architecture can change current C4I2 concepts for the near future. With tactical satellite radios in high demand as well as channel space on the satellite, one solution could be using surrogate satellites of either high attitude Air Force launched and controlled, or low orbit satellites that can act as a relay for data and voice nets. The impact on the current concept would be that most of the current radios planned for the AAAVC would have to be UHF, super high frequency (SHF) or Extremely high frequency (EHF) multichannel; consequently, the planned allocation of radios would have to change to support this concept. In addition to a fundamental change in transmission medium would be the types of circuit. The traditional voice nets for intelligence, fire support and logistics could easily become data nets.

Innovation and Doctrine

Doctrine drives planners to accept traditional requirements without considering alternatives that meet the needs of the commanders. For instance, the use of Electronic-Mail and commercial satellite systems to conduct planning and execution are coming faster and faster. However, Marines traditionally are skeptical when it comes to new systems, especially in the area of C4I2 and rightfully so--if it deals with electrons, a rock and a squirt gun can make it inoperable[12], but the truth of the matter is that these systems are required to stay integrated with the other services. For instance, the migration to a common operating environment, the JMCIS

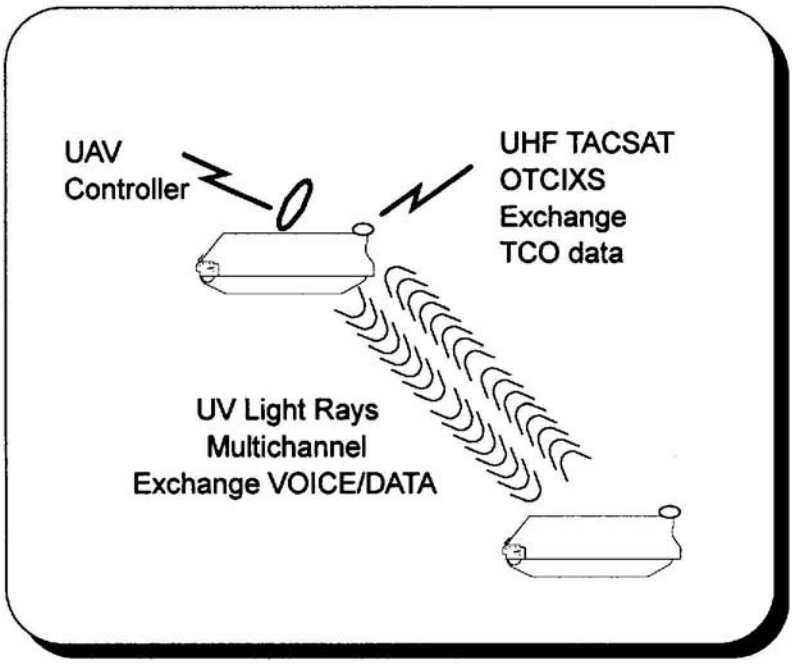
Tactical Combat Operations could easily fill several tactical command and control requirements with its current applications. The Navy has used, with relative success, the Joint Operational Tactical System (JOTS) for over a decade for command and control. Can a digital display of the battlefield solve the Marine Corps' command and control dilemma?

For instance, during a future amphibious raid, a map located in the Landing Force Operations Center (LFOC) aboard ship displays current threat information gathered from multiple sources. Then it can be digitally transmitted to the command AAAV and re-transmitted or broadcast to the subordinate AAAV commanders with mission type orders, allowing them to adapt to changing situations (Figure 2). A data link broadcast that is truly over-the-horizon, such as the Navy's Officer in Tactical Command Information Exchange System (OTCIXS) broadcast does provides a near real time picture for the commander as he moves to the objective.



(Figure 2.)

The wave commander then approaches his littoral penetration point of choice and signals for target engagement based on his sensor readings from UAV's and validated intelligence reports. His request for target neutralization is granted; the ship then launches precision guided munitions which neutralize the target, and allows the AAAV's to proceeds past the threat to the objective. At the same time, all coordination among the wave is done by ultra violet light multichannel communications signals, if in proximatey (figure 3).



(Figure 3.)

If, however, the threat is so great that maximum separation among AAAV's is required, the same coordination used in the previous scenario is done over satellite communications or

pseudo satellite relay above the amphibious objective area- -a mission for the Air Force to provide space-based support for joint operations. Most requests and reports will be completed by automatic computer generated signals, thereby eliminating the need for manual voice or data entries. For instance, a wave confronts a tank that can be seen by a UAV, satellite, or infrared sensor.

The Joint Intelligence Center validates and plots the tank. The enemy tank is now seen on the JMCIS display aboard the lead AAAV. Then the AAAV commander's on board sensors confirm tank location and type. The commander then chooses to engage and reads into the voice activated target engagement system "engage tank." The computer automatically prioritizes and calculates the last known position and sends digitized burst, tactical satellite radio transmission of target quality information to the naval gunfire support ship.

If this could be possible would the Marine Corps still need a voice net for fire support, intelligence, and command and control? Perhaps one or two nets for a command to command chat net would still be required. I submit that the time has come to get away from voice generated command and control and omnidirectional radio transmissions on the battlefield. Can the Marine Corps migrate toward voice activated message text and antenna systems that automatically move in the direction of friendly satellites either geosynchronise or low orbiting? The future of AAAVC is one step away from becoming a revolutionary way to fight.

Future C4I2 Concepts

The commandant's guidance when addressing command and control for OMFTS speaks of a new way of thinking. The challenge facing OMFTS is clearly in the future of C4I2. With the exploitation of today's technology, the Marine Corps can perhaps eliminate the requirement for individual functional nets such as intelligence, boat bravo, tactical air request, and position/location navigation. If OMFTS entails large areas of ocean and land coverage, then it is safe to say that current doctrine and equipment can not adequately satisfy the requirement for command and control, fire support, and logistics. Can the Marine Corps afford to slowly invest in yesterday's technology, for example Single Channel Air Ground Radio Systems that the Army fielded in 1970's to replace the vintage PRC-77 family of radios? Moreover, this problem is compounded when addition of non-compatible data systems are added to support decision making for the commander. Further, the potential for information overload increases with additional nets supporting complex operations. Perhaps the solutions are in establishing links similar to the Marine Air Command and Control System's data links. For instance, these Tactical Data Information Link A or B share track information as well command instructions using near real time sensor inputs such as radar or Global Positioning System. In short, TADIL A and B give the air commander a three dimensional picture of the air and ground space that is updated regulary by participating Army, Navy, Air Force, and Marine units. Additionally, technology that permits the rapid dissemination of intelligence will play an important role in this effort. Fortunately, as the Marine Corps moves to the JMCIS, perhaps it can satisfy battlefield management requirements through current software applications.

Conclusion

Command and control systems best suited to OMFTS will be very different from those developed in previous approaches to amphibious warfare. The high tempo of operations that is essential to successful OMFTS requires C4I2 systems that provide a joint, redundant, interoperable, OTH capability to support these elements of command and control, intelligence, fire support, and combat service support. Today's assault waves consist of a command vehicle equipped with several, short range VHF/UHF radios to operate as a combat operation center afloat and ashore. Are these types of radios sufficient for the future? No, the answer is in mobile satellite multichannel systems which reduce the amount of single channel radio nets, interference, and electronic signatures. Whether these multichannel systems are commercial or military systems, it is a better option than what is planned for on the current system which will contain up to seventeen single channel radios, both organic and strap-in from remote positions. When these systems are implemented, the ultimate objective of command and control will be met- -unity of effort and increased tempo of operations. Intelligence and information systems will become more efficient in time, however, success of the total integration of the current and new C4I2 systems depend on a capable OTH communications.

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[2] Earl Robert L. *"The Over-The-Horizon Alternatives"*, Marine Corps Gazette, pg 37 October 1988.

[3] Operational Requirements Document for the Advanced Amphibious Assault Vehicle (NO. MOB 22.1)

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[5] Dolan J. A**.,** *"AAAV C3 Systems Engineering & Integration In-Process Review".* Mitre Corporation 26 April 1995.

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[7] Technical Manual (TM) 11-5820-890-10-1 *Operator's Manual Radio Sets.* Washington D.C.: Department of the Army. February 1990.

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[9] Operational Requirements Document for the Advanced Amphibious Assault Vehicle (NO. MOB 22.1)

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